SYNOPSIS

ON

USAGE OF INFORMATION AND COMMUNICATION TECHNOLOGY SERVICES AMONG FARMERS IN HARYANA

For registration

In

Doctorate of Philosophy in Management

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Session 2020-2021

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1. INTRODUCTION

"I have seen first-hand that agricultural science has enormous potential to increase the yields of small farmers and lift them out of hunger and poverty."

-Bill Gates

"Agriculture is the backbone of Indian economy" as quoted by MK Gandhi, is absolutely relevant at all times. There is another relevant saying that the real India lies in villages; in similar analogy, India's development start with development of small scale farmers. India cannot be empowered without empowering small and marginal farmers to overcome their handicaps. The factors which hinder this vision are limited access to technology, government endeavour, resources, markets, institutions and services. After all, agriculture runs livelihood of 41.46 % of Indian population (World Bank, 2020). Indeed agriculture is one of the oldest and prime activities of human beings and has been a milestone in the history of whole human civilization. It was agriculture due to which men settled at a place, and started producing crops and livestock for economic purposes. Agriculture in India contributes 15.96% to our GDP in year 2019 and in 2020 first quarter, when all sectors was showing a negative GDP, Agriculture was the only sector that showed a positive GDP (The Hindu Newspaper 1 Sep, 2020) and millions of people derive their livelihood from agricultural sector. In spite of many successful research activities on new agricultural practices, majority of farmers are not getting upper bound yield due to several reasons. One of the reasons is that expert scientific advice on crop production and marketing is not reaching the farming community in a timely manner (Kabir, 2015). At every stage of farming such as Crop Cultivation, Water Management, Fertilizer Application, Fertilisation, Pest Management, Harvesting, Post-Harvest Handling, Transportation, marketing Indian farmers practice experience based farming and instead of following advice from agricultural experts, they generally follow the advice of local shopkeepers/agents who sell seeds, fertilizers, insecticides, pesticides, etc. Each phase of agriculture is important and all of them are infected with different problems which need to be addressed as soon as possible.

Commercial agriculture has taken over the traditional subsistence agriculture due to:

A. Increasing population- Agriculture produce must be increased in order to keep pace with ever increasing demand from growing population.

B. Decreasing Cultivable Land- Nearly 30000 hectares of cultivable land is decreasing every year. The area of cultivable land in 1988-89 was 185.142MH and now it has reduced to 181.95MH (India Times Newspaper 17 May, 2016).

C. Falling GDP of Agriculture sector – The contribution of agriculture to the GVA (Gross Value Added) has reduced from 18.2% in 2014-15 to 16.5% in 2019-20 (Economic Survey, 2019-20).

D. Deficiency of Extension Personnel- Estimates indicate that to disseminate advanced agricultural technological information to its 120 million farm holdings, India requires at least 1.3-1.5 million extension personnel against 0.1 million presently (Planning Commission, GOI, 2007). In India, during 2004, public extension (including the Krishi Vigyan Kendra centres) reached only 6.4% of the farmers, who instead, mostly got their information from other progressive farmers and input dealers (Binswanger-Mkhize and Zhou, 2012).

Internet makes it possible for farmers to gain knowledge of all aspects of technology before its adoption. When India has taken significant strides in the field of agriculture through the Green, Yellow, White and Blue revolutions, now it has embarked upon a 'Cyber revolution' which has the potential of becoming the biggest of all other revolutions.

1.1 Information and Communication Technologies

Information and Communication Technologies (ICT) is an umbrella term first used in 1970s. ICT consists of three main technologies viz; Computer Technology, Communication Technology and Information Management Technology. These technologies are applied for processing, exchanging and managing data, information and knowledge. Information and Communication Technologies facilitate the processing and transfer of information i.e. communication by electronic means. ICT generally links

information processing devices like computers with telecommunication technologies like telephones, wired or wireless networks (Michiels and Crowder, 2001).

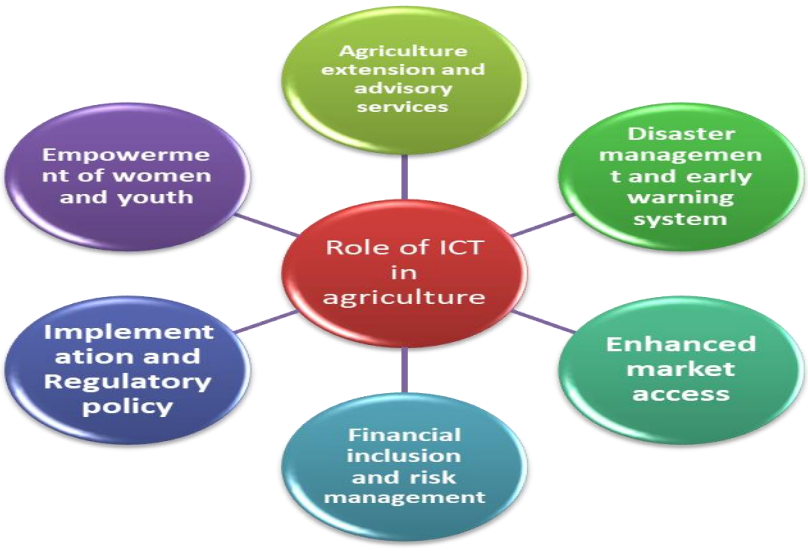
1.2 ICT and Agriculture

Bringing together representatives of leading development organizations involved in agriculture, Food and Agriculture Organisation (FAO) hosted the first e-Agriculture workshop in June 2006 (Brynjolfsson, 2009). The meeting served to initiate development of an effective process to engage a wide range of stakeholders involved in e-Agriculture, and resulted in the formation of an e-Agriculture Community of Practice Founding Group.

One of the historic initiatives taken by the Govt. of India is integration of ICT to agriculture. "Information and Communication Technology" is a big revolution in Indian farming community which helps in getting information about Agriculture production and strengthens market linkages between farmer and Mandis. In 2013 the revenue of the Indian ICT sector was valued at US$ 108 billion and is expected to reach the US$ 225 billion landmark by 2020 (Assocham, 2017). The industry performance this year demonstrated the sector's ability to innovate and deliver differently, in order to maintain the growth trajectory.

E-Agriculture constitutes development and application of innovative ways for the ICT's to be used by small and marginal farmers to help them link with the Agriculture Produce Market Committee (APMC). The importance of agricultural extension in providing the relevant information, technology and knowledge to the farmers to create an enabling environment to increase production and productivity is quite clear, as mandated under the National Agricultural Extension Policy (NAEP). In this context, ICT in Farming is used as an umbrella term encompassing all information and communication technologies including devices, networks, mobiles, services and applications; these range from innovative Internet-era technologies and sensors to other preexisting aids such as fixed telephones, televisions, radios and satellites. With the integration of ICT to agriculture, government of India visions to reduce the gap between administration and farmers, and help marginal farmers maximize their productivity while keeping sustainable development in mind. The prime focus being rural domain of India, our farming community will take a leap with the help of information on various domains provided to them through ICT. The General Directorate of Extension and Agriculture Development (GDEAD) has been developing many ICT innovations in linking research-extension-

education for agriculture, which will create a common architecture for digital information aggregation and services in the context of agricultural practices involving multiple institutions and stakeholders with widely varying requirements and criteria for usefulness or effectiveness. By distribution of correct information about farming related services, ICT helps farmers increase their income and hence, profitability. Our Prime Minister Sh. Narendra Modi has also been emphasizing on projects which can help double the income of farmers, application of ICT in agriculture is one such project (NITI Policy, 2017). This initiative will be helpful for those involved in horticulture and agriculture and will also add more to the nation's GDP. The Information and Communication Technology is also creating new job opportunities in Private as well as Government Sectors. It has created ample of jobs for IT specialists and Agriculture Extension officers who work for development of rural India with the help of ICT. Information and Communication Technologies develop solutions to provide farmers with real-time and accurate information regarding new technologies, good agriculture practices, Mandi rate, fertilizer and pest control related information. Services from some private organizations like Godrej Agrovet, Syngenta, and TechnoServe are already working to provide basic information regarding Mandi price and other agriculture related information.


Agriculture extension and advisory services
Disaster managemen t and early warning system
Enhanced market access
Financial inclusion and risk management
Implement ation and Regulatory policy
Empowerme nt of women and youth
Role of ICT in agriculture

(Source- Parmar et al., 2019, FAO 2014)

1.3 Information needs of farmers

The prime focus of ICT in agriculture is to meet the farmers needs for information. Following are some vital needs of farmers which are imperative for the growth and development of agriculture:

1. Markets: To enable farmers to compare prices and help them sell their produce at better prices, bringing information from markets outside their villages is a priority.

2. Information on latest techniques and technologies: Continuous advancements in technology bring up gradation to agricultural machinery and techniques too. Up to date information regarding latest technologies in agriculture and animal husbandry is of immense importance for growth.

3. Information about rural development programme and subsidies: Detailed information related to Government initiatives for rural development and details of grants for the areas suffering from droughts, floods or other natural disasters, is very important, particularly, to small and marginal farmers.

4. Weather forecasting: Real time weather related information such as temperature, humidity and forecasts on rains.

5. Latest packages of practices: Information on best practices of cultivation is important need of the farmers. Information regarding drought resistant varieties of certain crops can be important for farmers to withstand longstanding droughts in some areas.

6. Post-harvest technology: Education on post-harvest technologies and storage is as vital as pre-harvest. Farmers are getting aware of the value addition of food processing.

7. General agricultural news: General news and information related to various agricultural events in villages and districts

8. Information on insurance/claim processing: Detailed information on crop insurance schemes, the type of damage covered and compensation offered, premiums to be paid, etc.

9. Input prices and availability: Pricing and availability Information of agricultural inputs like seeds, fertilizers, manures etc.

10. Early warning and management of diseases and pests: In the areas of continuous droughts; pests and diseases do not generally pose a major threat. However, in other areas this information can be very useful.

1.4 Some of the ICT Initiatives For Agricultural In India

Looking back over 25 years, since the first use of ICT in Embalam village of Pondicherry, today, the information age is upon us and brings huge possibilities for ICT in agriculture. Approximately 45 percent ICT projects of the whole world have been implemented in India and also maximum number of information kiosks has been employed in rural India (Manzar, 2004 Saravanan, 2013). Nevertheless, it was found that majority of the ICT projects in agriculture were put into action in socio-economically developed states of South and North India, while deprived states are not benefitted by ICT initiatives. Some of the government and private initiatives are-

- Farmer's portal (https://farmer.gov.in/)
- Kisan call centre (https://dackkms.gov.in/account/login.aspx)
- M-Kisan (https://mkisan.gov.in/)
- E-MAUSAM (http://emausamhau.gov.in/)
- Common Service Centres (CSC) (https://csc.gov.in/)
- E-NAM (https://www.enam.gov.in/web/)
- Kisan Rath (https://kisanrath.nic.in/)
- Meri fasal mera byora (https://fasal.haryana.gov.in/)
- Agri app (https://www.agriapp.co.in/shop)
- Iffco-Kisan (https://www.iffcokisan.com/home/services)

1.5 ICT and Agriculture in Haryana

On 1st of November 1966, Haryana was carved out of the former state of East Punjab. Situated in Northern India, Haryana has 6 administrative divisions, 22 districts and 72 sub-divisions. The state of Haryana occupies less than 1.4% (44,212 km²) of India's total land area and about 86% of this area is arable, out of which 96% is cultivated (ICFA, 2017). Haryana is traditionally an agrarian society and produces a variety of agricultural crops. Wheat and Rice are majorly grown crops. Agriculture being primary profession caters to

the livelihood of more than 65% rural population and makes up more than 15% of the state GDP (Economic Survey, 2019).

The Haryana state IT policy was approved in June 2000 with a vision to transform Haryana into an IT driven economy. In accordance to change in time and to remove the limitations of previous policy 'IT-ESDM Policy, 2017' was launched, it endeavours to give the required impetus to achieve the goals set by the leadership and met the aspirations of people of Haryana (IT & ESDM policy, 2017). Besides upgrading the standard of administration, in social and public services, the emphasis was on improving the quality of life of people. E-governance in the state aims at IT driven system that works better, costs less and is capable of serving the decision making machinery as well as citizens' need. With technical assistance from Information Technology Department, NIC, HARSAC and HARTRON, various Departments of Haryana have successfully implemented important e-governance projects.

The Digital India, a flagship programme for technology enablement, with a vision to transform India into a digitally empowered society and knowledge economy had launched by the Government of India in 2015. Among the nine pillars of the programme e-Governance, e-Kranti, Universal Access to Mobile connectivity, Information to all are the pillars which have the potential to redefine the way government services are delivered to the citizens. The State of Haryana has always been at the forefront of the IT transformation in the country, and is once again making targeted efforts towards the implementation of Digital India vision in the state. In 2015, the state bagged the prestigious 'Skoch Order-of-Merit' national award for implementation of six e-governance and IT initiatives and in 2017, they also got national award for implementation of 5 national award in smart e-governance projects (SKOCHAWARD, 2017). The state has the right ecosystem to become Digital Haryana on the lines of Digital India for which Haryana has planned to partner GOI in its Digital India programme. As access to ICT continues to increase among farming communities and information services continue to adapt and flourish, the scope exists for much better agricultural productivity which will impact the growth of rural India and hence the future, positively.

2. LITERATURE REVIEW

In any scientific investigation, a comprehensive review of relevant literature is imperative. Besides, giving knowledge of work already done in the area and providing insight into methods and procedure also provides a basis for operational definitions of major concepts. Till now very few studies have been conducted on influence of Information and Communication Technologies (ICT) on farming community. However, studies having direct or indirect link with the present investigation have been reviewed and presented under following major heads:

2.1 Importance of Information and Communication Technologies in agriculture

2.2 Attitude of farmers towards Information and Communication Technologies

2.3 Impact of Information and Communication Technologies on farming system

2.4 Constraints faced by farmers during usage of Information and Communication Technologies

2.5 Adoption of Information and Communication Technologies among farmers

2.6 Information dissemination among farmers by use of ICT

2.7 Use of mobile phone for access of ICT services

2.1 Importance of ICT in Agriculture

The applications of Information and Communication Technologies (ICT) are vast in almost all major areas that one can think of and agriculture is no exception to the same. And development in agriculture sector is very essential for poverty reduction, environment protection, to save climate deterioration and directly or indirectly development of all sectors depend on agriculture (Sideridis et al., 2010). ICT's implementation to agriculture sector will significantly accelerate its development.

Foremost evidence of ICT's importance in agriculture is the use of cloud computing and wireless sensors in agriculture which has concluded that the technology can help farmers in taking better decisions in proper time as well as in accordance with the database, actual conditions and expert suggestions which can lead to increase in farm productivity and profitability of farmers (Parashar, 2016). Various projects are being implemented worldwide for the integration of ICT in Agriculture. Statistics of services provided by various ICT projects in Africa have helped in identification of advantages and shortcomings of such projects (Gakuru et al., 2009). It was identified by FARA (Forum for Agriculture Research in Africa) that most projects work only on pilot basis on a short term

& disappear after the original donor funding has ceased. The beneficial practices adopted by countries like Africa can be applied to agriculture in India and if reliable information is provided in proper time, it will lead to greater advantage for farmers (Singh et al., 2015). Though one major barrier in making this vision feasible is the requirement of high level of investment in infrastructure which can be enjoyed by only those in high income group. This division of extent of benefit from ICT caused by income disparity is also called Digital Divide. Though, such challenges can be resolved by proper timely support from Government.

Besides few resolvable downside, ICT in many ways, helps farmers in every aspect of crop production, it makes agricultural system capable of catering the specific needs of farmers in well-organized manner and on proper time which in turn, leads to decrease in cost and increase in productivity and profitability of farmers (Amiete and Nehra, 2016). For instance, a proposed android application called 'kisan vikas' provides continuous information to farmers about weather, crop price, agricultural news etc. This app was tested on a small scale of respondents in Himachal Pradesh (India) and farmers turned out to be very happy to use this app. By the use of it, they could bypass the need to visit market for various information related to crops which led them to significant time and cost saving (Narechania, 2015). The term e-Agriculture has been coined for such practice of exchanging information, ideas, resources related to the use of information and communication technologies (ICT) for sustainable agricultural and rural development. (Chauhan, 2015) studied the advantages and challenges of e-Agriculture and found out that in most cases the concept of e-Agriculture benefits the farmer and the main factor hindering its implementation is illiteracy. Upon studying the benefits of e-agriculture and various initiatives of e-Agriculture, (Singh et al., 2017) suggested the framework for ICT projects in India. This study also established that e-agriculture benefits the farmers in all spheres from decision support to widen market access.

A study concluded that up to 40% of crop loss could be prevented with quick information by the use of ICT which could be used to gain better knowledge of fertilizer, disease management, crop management, etc. (Jairath and Yadav, 2012). Information is needed in every aspect of crop but weather information is the highest priority information needed by farmers. Affordable services such as mobile phones can have a great impact on information needs of farmers, if implemented properly. Among all the farmers using mobile phones, about 87.20% used the mobile phone for accessing agricultural

information, though, limited aptitude and skill of farmers to be able to use mobile phone is a major constraint in its practicality (Khan et al., 2019).

2.2 Perception and Attitude of Farmers

Whatever it is that one wants or needs to do, willingness, determination, attitude and perception are very important for its accomplishment. When studied the perception of farmers towards ICT and constraints in adoption of ICT services in North-Eastern region of India, (Baruah, 2019) found that the awareness about ICT services is very low and the farmers lack training to be able to use such services. There is an undeniable need to create awareness and training programs for farmers on how to use ICT services. Farmers have a very positive attitude towards these services, indeed, most young farmers who are already involved in making use of ICT services, pointed out that for farmers, market price of agricultural products is the most relevant service among all others (Lokeswari, 2016). In another study, most of the respondents agreed that the ICT can be a useful source of information. Respondents emphasized that education has a positive relationship and age an inverse relationship with the application of ICT and that T.V. and mobile phones are most used source of information by farmers (Aldosari et al., 2017). Similar studies were done by (Chauhan, 2010) to study opinion and expectations of farmers; (Kumar and Ratnakar, 2011) measured the attitude of farmers towards ICT based services; (Jamwal, 2011) determined the feasibility of ICT applications in agriculture; and some surveys have studied the relevance of ICT by studying statistics by those farmers who have been using these services already, one such study was done by (Dhaka and Chayal, 2010) which concluded that 51% farmers use ICT services to get needed information (marketing information and the weather). Though, not all services are equally welcomed by the farmers, some are accepted at wide scale while others find it difficult to gain their faith. (Meera et al., 2004) studied three ICT project for agriculture development- ‘WARANA’ in Maharashtra, ‘GYAANDOOT’ in Madhya Pradesh, ‘I-KISAN’ in Andhra Pradesh and observed that in all projects most of the respondents showed a high level of faith, although there is a some interesting difference in the service perception, 90% respondents perceived that the ‘GYANDOOT’ project is best tool for getting market information, 87% respondents preferred ‘WARANA’ project for question and answer services and 66% perceived that ‘I-KISAN’ is best for pest & disease management in crops. Despite of the

willingness of farmers, the implementation of ICT in agriculture depends on several factors such as training of farmers, awareness among farmers, ICT infrastructure, etc.

E-Agriculture is being welcomed globally. Nigerian farmers have a favourable perception towards the ICT tools. Most of the Nigerian farmers are of young age and use mobile phones to get relevant information related to weather and market, they feel that there is a significant positive relationship in education, income and the adoption of ICT services (Osondu et al., 2015). In Bangladesh too, 60% of farmers have a favourable attitude towards the ICT services & the main factor for adoption are age, education, experience of farmers while the major constraint is lack of electricity and connectivity in rural areas (Kabir, 2015). In India, approximately 70% respondents have a positive attitude towards the use of ICT tools and they feel that ICT tools helps in decision making process for farmers. And studies have also found that scientific orientation & risk orientation of farmers are two major factors that influence the attitude of farmers (Raghuprasad et al., 2012). In a nut shell, ICT services have a very positive influence on farmers who have adopted these services in one way or the other. Many farmers find that the use of mobile services is very easy and convenient and the information on pest & disease control is most important. The quality, reliability and time of information are the major factor in adoption of mobile advisory system (Ganesan et al., 2013).

2.3 Awareness/ Adoption

Theory- For the dissemination of information- Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behaviour, or product. Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behaviour, etc.). The key to adoption is that the person must perceive the idea, behaviour, or product as new or innovative. It is through this that diffusion is possible. The guiding principle for the diffusion of innovation framework is that an innovation's reception is dependent on social context, which explains why proven-efficacious interventions are not used in community practice, while other interventions with minimal research support gain widespread acceptance.

The decision to accept, adopt, and use the intervention is not an instantaneous act, but a process consisting of four stages: dissemination, adoption, implementation and maintenance (Rohrbach et al., 1993). During dissemination, administrators are made aware of programs and encouraged to adopt them. During adoption, administrators form attitudes towards the intervention and commit to initiate the program.

Model- Technology Acceptance Model (TAM) proposed by Davis (1989) has been widely used, accepted and tested. Davis' model is based on the premise that attitude affects intention, which in turns leads to certain kind of behaviour. To explain user acceptance behaviour, Davis proposed two constructs viz; "perceived usefulness" and "perceived ease of use". Both these independent variables represent the end users' belief in technology and can be used to predict their attitude towards the technology and its ultimate acceptance.

Only 32% of farmers in Kenya operationalized the concept of e-Agriculture and e-Commerce, majority of farmers have not implemented the concept of e-agriculture and the major cause behind it is unawareness of farmers about various services of e-agriculture (Namisiko and Aballo, 2013). Nigerian farmers have more awareness of traditional ICT tools (radio, television) although they are using more modern tools (internet, mobile) even when modern tools are accompanied by high cost and service failures (Taylor et al., 2012). In India, the awareness level of farmers is very low and awareness programs need to be organized by the government so that the farmers can know how to get best use of information (Thankachan and Kirubakaran, 2014). Farmers perception, literacy and the funds required to adopt technology are the major factors in usage of technology among farmers (Abdullah, 2013). In a study, (Parmar and Soni, 2019) compared access to information between the users and non-users of ICT and results revealed that information sought from ICT sources had a positive influence on access to production & marketing information and non-users had a negative influence on productivity. This study also suggested that the training programmes should be arranged especially for females on how to get information from ICT services. The socio-economic factors that affect the adoption of ICT by farmers cannot be ignored. In most cases, the farm size and education level of farmers have a positive relationship with the ICT while the age of farmers have a negative relationship with ICT (Mittal and Mehar, 2016).

Not only services related to information but other technologies such as precision agriculture (PA) technology greatly rely on farmers perception. PA provides opportunity

to create efficiency in farming business and it also leads to environmentally sustainable farming practices. Despite of widely accepted diverse benefit of PA, its adoption is relatively low and for its adoption the farmers must perceive the technology as useful and easy to use (Aubert et al., 2012). In few parts of India ICT is already being accepted and is impacting lives of those utilizing it positively. North-East India is one such region where majority of farmers have been using the mobile phone to get agricultural information. Mobile phone is used by majority of farmers due to ease of use and availability, also, agricultural marketing is the most accessed information among the farmers using it (Syiem and Raj, 2015). Even in PAN India, information about weather & market are most sought by farmers (Patil et al., 2008).

There is not any deficiency of knowledge in agriculture sector but the main challenge is how to disseminate information and make it reach to all farmers in appropriate and timely manner. In simpler words, knowledge management is required in agriculture sector (Kale et al., 2015). All these challenges can be tackled by examining each of the individual factors that affect the farmers in technology adoption and by proposing different models for technology adoption in agriculture (Aubert et al., 2012).

2.4 Impact

Countless studies have proved that the impact of ICT projects on farmers' lives is huge and it is undoubtedly positive. ICT users get better marketing information in comparison to non-ICT users and hence they are able to take better quality decisions in all aspects of agriculture marketing viz. selling price, transportation, input price, buyer demand etc. (Binta et al., 2019). The impact includes expenditure being reduced by 3.6 times in comparison to traditional extension system and sixteen times less time required by the farmers to avail services (Raj, 2013). The more impact among ICT tools is of television on farmers on the young age of 25-40. But there is not any impact of ICT on finance due to some collateral issues and the main source of finance to farmers are friends or relatives (Iliyas, 2015). State and central Government schemes can also bring positive effects on use of ICT services by farmers. For instance, many farmers were benefit by free SMS services provided by "Karnataka state agriculture marketing board". Most of the farmers (86.36%) expressed that the information provided was accurate which helps in selling their commodities at right time or right place and results also showed that about 47% farmers were of young age groups (25-40 years) and about 96% farmers were educated and the

main benefit of this service was to medium and large farmers (52%), because they could afford the transport and other expenses to sell their crops at far places to sell at higher prices (Patil et al., 2013).

In Sindh province of Pakistan mobile phones are extensively being used by farmers for information about weather forecasting and agricultural marketing. In that region, most of the respondents (97%) own mobile phones but only 23% respondents use it to get information. In-spite of various benefits, not all farmers are using mobile phones properly for information purpose (Chhachhar et al., 2016). In India, services like 'Kisan mobile advisory' proved very beneficial in getting various information related to input supplier, weather forecasting (Tiwari and Bala, 2014). By quality information inputs, the decision making abilities of farmers can be improved. Even though e-Agriculture has various benefits, the adoption level of ICT services in developing countries is very low, major reasons being, network issues, investment required and illiteracy of farmers. All these barriers can be tackled by timely support from Government and co-operatives. Government should start the capacity building programmes for farmers, so that the farmers can get benefit from ICT services and enhance their income & standard of living (Chhachhar et al., 2014). The information provided should be location specific and by whatever source the information is provided (SMS, call, etc.), it must be properly understood. Also it is better to understand the financial sustainability of programme, so that the information is provided in an efficient & effective manner to farmers (Nakasone and Torero, 2014). National strategy is needed for penetration of IT services in rural areas & there should be a proper revenue model for ICT projects so that they can sustain in long run (Iliyas, 2015).

2.5 Barrier/ Constraints

Use of technology by farmers will not just ensure agricultural empowerment but can help in tackling problems of global concerns such as conservation of water and soil and can help India step up in ensuring sustainable development (Dwivedy, 2011). The barriers in implementation of e-Agriculture can be tackled easily by classifying them into groups such as community, training and research, political and adoption issues (Mahant et al., 2012). Plans can be made to easily and systematically alleviate these groups. The major constraints making up such a barrier for world-wide application of e-Agriculture include illiteracy of farmers and cost (Thankachan and Kirubakaran, 2014). In Indian context lack

of awareness, illiteracy, unavailability of content in local languages and internet connectivity (Chandra, 2011), scarcity of investments, one way information flow and difficulty in localization of content (Rohila et al., 2017) are major constraints in application of ICT.

In many studies it was concluded that major factors resulting in non-acceptance of ICT services are lack of confidence & skills in farmers to use ICT services. Also most services are available in English language and due to illiteracy they do not understand English & are not able to use ICT services (Syiem and Raj, 2015). Owing to the infrastructure requirement, there is a big gap in theory and practicability of ICT (Rasheed et al., 2012) which can be resolved only with extensive effort to connect all rural areas by internet and related services. For immediate resolution of various constraints, use of traditional extension methods (such as TV, radio, etc.) should be supplemented with the modern ICT tools (Manjeet, 2019).

2.6 Mobile phone

The advantages & limitations of mobile phone usage in dissemination of agricultural information and related services are many. By the use of mobile phone one can access various agricultural services such as weather forecasting, marketing information etc., though high cost, lack of mobile infrastructure, lack of locally relevant content etc. are few challenges preventing such use of mobile phones (Tiwari and Bala, 2014). Several solutions can be adopted to tackle all the challenges and specially the challenge of providing locally relevant content can be overcome by the development of a mobile app like ‘KRISHI VILLE’ by (Singhal et al., 2011) which provides location specific delivery of information, reliable information, and ‘one stop solution’ for all agriculture information as needed. And to simplify the process even more, existing social media applications such as whatsapp can be used to maintain linkage between farmers and agriculture experts (Devanand et al., 2018). It will not just be easy to use but will also be more cost effective and less time consuming.

2.7 Information Requirement

To step into the age of technology, to make use of it in a proper way, information related to market, crop management etc. is needed by the farmers. But this information would not be of much use if supplied in just one language. As most of the farmers are illiterate, their

specific needs of information should be analysed and supplied in local languages and that too via mobile phones primarily, because almost everyone already has access to mobile phones and farmers would not need to invest in another equipment if mobile phones become their source of information. Besides, as they are already familiar with how mobile phones work, it will not be needed to train farmers extensively to use it for their needs as well. Relevant information must be provided based on the region itself, overall two-third of farmers perceived that market information is the most important information needed by the farmers and farm management is less appropriate (Shalendra et al., 2011). A framework proposed by (Reddy and Ankaiah, 2005) for effective agriculture dissemination system to farmers to improve crop productivity, caters to such need of farmers. By the use of this system, the timely and location specific personalized information is provided to farmers, by which the efficiency of farmers are increased and the costs to farmers are decreased that can lead to increase in overall profitability of farmers. It enables farmers to produce a crop with the same expertise as an agricultural expert. Also by providing market information, the farmers will be able to grow crop in accordance with the demand of market.

2.8 Information Dissemination

PROCESS- Knowledge Management in Agriculture (KMA) is the process of generation, processing and creation of database, dissemination and effective utilisation to meet current and emerging challenges in agricultural development. Knowledge is considered as the fourth production factor after labour, land and capital (AFAAS, 2011) and is particularly crucial factor for the agricultural development. Right knowledge, at right place and right time accessible to the farming community helps to improve production, productivity and brings higher income. If the agricultural sector is not backed by modern agricultural knowledge and information, farming community in the developing countries are likely to remain trapped in low productivity, food insecurity and poverty. In this context, KMA is important in promoting sustainable livelihoods and reducing rural poverty.

ICT has reduced the gap between knowledge & farmers but, owing to lack of training & skills among farmers, lack of infrastructure in rural areas, ICT has not been able to completely remove this gap (Jayade et al., 2014). It is due to these factors that mobile phones being affordable and easy to use can be the best tool for agriculture extension (Saravanan, 2005). Accordingly, information can also be classified according to the

mechanism used (For example, text, voice, mobile) (Aker, 2011). Existing constraints such as information asymmetries may be reduced by framing models on content development and management cycle (Glendenning, 2012) and of course, by the use of other ICT tools as well, which can enable the access of more marketing opportunities to farmers (Gikandi and Bett, 2009).

2.9 Empowerment

E-agriculture does not merely help increase yields of crops by supplying information in time to farmers but it also leads to economic, social and psychological empowerment of farmers and e-agriculture alone contributed to 84% in the variation of empowerment (Mohammed et al., 2016).

Trend

Among all other services of e-Agriculture, e-Commerce is the most focused area by both the service seekers and providers as it helps in making the process of marketing of crops better and convenient (Fernando et al., 2016). Since, in recent years china has done intense research in the field of agriculture, most of the articles studied were related to china. But they are majorly applicable to India and many other developing nations as well.

Research gap identified

After scrutinizing the available research articles, government of India (GOI) reports and various newspaper editorials; following research gaps are identified:

- Not much detailed work has been done till date to know exactly whether ICT schemes have contributed anything in upliftment of farmers.
- The previous studies conducted in this context have not addressed as to how the implementation of ICT schemes have affected the various associated parties like farmers, mandis, commission agents etc.
- Most of the previous studies had done in South India and very few studies done in north India.
- Previous studies have not addressed the perceptions of Extension Officers with regard to ICT services.
- Previous research works have not addressed the impact of ICT services on farming decisions.

So, to fulfil the above mentioned gaps, the present study entitled, is being undertaken.

3. OBJECTIVES OF THE STUDY

- To study the usage of ICT tools among farmers;
- To study the socio-economic and personal characteristics of farmers using ICT;
- To study the usefulness of agriculture initiatives by ICT among farmers; and
- To study the Perception of agricultural Extension officers towards ICT utilization.

4. RESEARCH METHODOLOGY

Research methodology is a well-defined procedure and technique used to find solution for any research problem. A research problem may take several steps or statistical tools to find its solution. The researcher has to stick to these predefined steps to find a solution. The research methodology answers two main questions.

I. How the data would be collected?

II. How the collected data would be analyzed?

A researcher needs thorough knowledge to define the research methodology for a research problem. A well-defined research methodology plays role of guide for researcher to find a solution and conclude it. So, it plays a vital role in research problem.

4.1 Research Design

A research design is a blueprint for answering the research questions and fulfilling objectives. It is a crucial part of research methodology. Social research needs a well-defined set of steps before data collection. A good research design enables the researcher to collect the evidences to get answer of the initial question as precisely as possible. The present study is exploratory in nature for farmers and extension officers in Haryana. Exploratory study will be used to explain the Usage of ICT tools, Socio-economic and personal characteristics, usefulness of ICT initiatives among farmers and Perception of extensionary officers towards use of ICT. To make the study more reliable and accurate self-structured questionnaire will be used to conduct the study.

4.2 Research Universe

The universe of the study is Haryana. The Haryana state comprises twenty two districts. The respondent of the study is farmers. The researcher will get information about Factors of Awareness, Perception and influence of ICT schemes. Keeping in view the sample of

the study, the Haryana state will be divided into six administrative divisions i.e. Ambala, Faridabad, Gurugram, Hisar, Rohtak, Karnal.

4.3 Sampling Design

The universe of the study is large enough and we cannot study all the units of universe, so we will choose sampling units from the universe. We will use multistage sampling technique to choose our sampling units. In the first stage, one district will be selected from each division. In the second stage, from the selected district, two blocks will be selected. In third stage, out of selected blocks, two villages will be selected. In the last stage we will select some farmers from the villages. And nearly 100 Extension Officers from 6 administrative zones of Haryana will be selected. The sample size of the study is to be purposed to five hundred eighty but it can be increased or decreased according to the requirement of the study. Random cum convenience sampling will be used to reach the required sample of farmers from different group of farmers.

4.4 Data Collection

To achieve the objectives, required data will be collected from primary as well as secondary sources.

Primary data: The data required for the study will be collected with the help of Schedules.

Secondary data: The secondary data will be collected from various published sources like magazines, journals, newspapers and internet.

4.5 Statistical Tool

The data collected will be analysed and interpreted by applying need based statistical tools and techniques like percentage, mean, standard deviation, correlation, regression, exploratory factor analysis, confirmatory factor analysis and structural equation modelling (SEM).

5. RELEVANCE OF THE STUDY

Despite having highest cropped area, India's crop yields is lower than that of US, Europe and China, One of ways to improve this situation is dissemination of required information amongst the farmers and this is where information and Technology comes in the picture.

There is a huge gapping hole between the required information and the available information to farmers even at the time when Government is playing an active role through making and implementing various schemes for providing these vital information to the subjects. The study will be conducted on Haryana in India, with the help of current study we shall know about the ICT initiatives from farmer's and extensionary officer's perspectives. Previous researcher's findings laid foundation for ICT schemes and present study will help in understanding the Usage of ICT tools, Socio-economic and personal characteristics, usefulness of ICT initiatives among farmers and Perception of extensionary officers towards use of ICT. The findings of the study will be beneficial for governmental agencies in adopting the more realistic approach in implementation of various ICT schemes.

6. ORGANIZATION OF THE STUDY

The study is proposed to be organized in following chapters:

Chapter 1: Introduction: In this chapter, conceptual framework and objectives of the study will be presented.

Chapter 2: Literature review: In this chapter, literature related to topic will be reviewed to support the present study. With the help of this review, research gap will be highlighted.

Chapter 3: Research Methodology: This chapter will provide a quick glance on the research process to be followed to achieve the objectives of the study. The chapter will also contain the information on all the statistical tools to be used for analysis and interpretation of data during the course of study.

Chapter 4: Analysis and interpretation: This chapter will be dealing with analysis of collected data to achieve the objectives of the study.

Chapter 5: Findings and recommendations: This chapter will summarize the major findings of the study. It will also provide some recommendations based on research findings, which is the goal of this research proposal.

Chapter 6: References: The purpose of a reference list is that the reader should be able to find the references used.

The above scheme of the study is tentative in nature. It may change as for the requirement of the study.

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